sat-nms LFTX/RX

Optical Links

User Manual

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1 Introduction

This document is the user manual provided with the ***sat-nms*** LFTX/RX fiber optical link equipment. It contains all necessary information how to install, setup, and operate the unit. The user manual is available as a printed document and for on-line reading on the optical links itself as well.

The ***sat-nms*** LFTX/RX fiber optical link is a high performance transmission system which transmits a complete frequency band, with all its separate carriers, over a single mode fiber with length up to 5km. The big advantages of fiber optical links are:

- Lightning protection
- Fully isolated between the two destinations
- No ground loops
- bug proof

Two types of optical converters are available

sat-nms LFTX	optical transmitter which converts from IF input spectrum to optical output at 1310nm
sat-nms LFRX	optical receiver which regenerates the optical signal back to an IF spectrum

SatService offer the LFTX/RX modules for different frequency bands.

sat-nms LFRX-L and LFTX-L	950 to 2150MHz
sat-nms LFRX-B and LFTX-B	50 to 2150MHz
sat-nms LFRX-10 and LFTX-10	950 to 2150MHz and 10MHz reference frequency for BUC

The paragraphs below give a short overview to the contents of the documentation. A subset of this documentation is stored on the device itself, the complete documentation is available on the ***sat-nms*** documentation CD and at www.satnms.com.

- Installation: The installation chapter guides through the installation and setup of the ***sat-nms*** LFTX/RX . It describes the mechanical concept of the chassis and the assignment of the connectors. Finally you learn in this chapter how to set the ***sat-nms*** LFTX/RX's IP address, which is a essential precondition to operate the ***sat-nms*** LFTX/RX by means of a web browser. This section is available in the printed version only.

- Operation: The ***sat-nms*** LFTX/RX is operated using a standard web browser like the Internet-Explorer or Mozilla Firefox. The user interface design is straight forward and clearly structured. Operating the ***sat-nms*** LFTX/RX is mostly self-explanatory. Nevertheless, the 'Operation' chapter outlines the map of web pages which make up the ***sat-nms*** LFTX/RX user interface and elaborately describes the meaning of each alterable parameter.

- Remote Control: The ***sat-nms*** LFTX/RX provides a versatile remote control interface. A monitoring & control software may fully operate the ***sat-nms*** LFTX/RX either through a TCP/IP network connection or through the RS232 interface of the ***sat-nms*** LFTX/RX. This chapter describes the communication protocol used for remote control and lists all parameters accessible through the remote interface.

- Theory of Operation: This chapter gives a short overview how the optical links work and which features are supported.

- Specifications: At the end of the document, the specifications applicable to the ***sat-nms*** LFTX/RX are summarized in this chapter.

Support and Assistance

If you need any assistance regarding our ***sat-nms*** Optical Links, don't hesitate to contact us. We would be pleased to help you by answering your questions.

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2 Installation

This chapter describes how to install the ***sat-nms*** LFTX/RX Fiber Optical Link. You find a guide how to connect, configure and mechanically mount the equipment below.

Before you start, please first read the Safety Instructions chapter below. It contains some important recommendations to prevent damage from the equipment.

Then, we strongly recommend to do a first setup of the unit on a lab desk before installing it at it's final location. This is mainly for the following reason:

1. To setup the IP parameters, the PC used for configuring and the chassis must either be connected to the same Ethernet hub / switch or must be connected directly with a crossover cable. The initialization program does not work through routers intelligent network switches.

Hence, the typical sequence of tasks when putting an ***sat-nms*** LFTX/RX into operation is as follows:

1. Read the chapter Safety Instructions
2. Set the unit's IP address
3. Mechanically installation of the chassis
4. Connecting the LFTX/RX
5. Configuring the LFTX/RX

2.1 Safety Instructions

Failure to observe all Warnings and Cautions may result in personnel injury and/or equipment damage not covered by the warranty.

- **ATTENTION Optical Radiation!** If connected to a power supply, the unit provides invisible Laser-radiation. The source is class 3R Laser diode as defined in DIN EN 60825-1:2001-11. P0=2mW, Lambda=1310nm. Never look into fiber-optical components like connectors or fibers. Use an infrared viewer, optical power meter or fluorescent screen for optical output verification.
- Do not allow any dirt or foreign material to get into the optical connector bulkheads. This may cause damage to the polished optical connector end faces
- Follow standard Electrostatic Discharge (ESD) procedures when handling a the chassis and the modules of the LFTX/RX.
- Select and apply the appropriate 110…240AC voltage according to the data sheet and documentation **before** connecting power.
- Depending on configuration, the chassis is equipped with User-changeable power supplies. Always disconnect the mains of the power supply that has to be changed. Wait at least 10s after disconnecting the mains (for internal discharge of the power supply) before removing the power supply **ATTENTION:** To avoid the possibility of an electrical shock, never handle with a power supply that is connected to mains.
- The power supplies are EMI filtered. The chassis is connected to earth ground in compliance with safety requirements. Always use the 3-prong AC plug with earth ground to avoid possibility of electrical shock hazard to personnel.
- Before you connect the LFTX/RX to an L-Band distributor or LNC , please make sure that the unit to which you connect can handle 15V D/C voltage on its RF L-Band input. Some L-Band IF distribution equipment does not have D/C blocks included and the unit could be damaged. If you are not sure how the interfacing equipment will behave, switch off the LNC supply voltage in the Setup menu or in case of local controlling by hardware switch before you connect the cable.
- The LFTX/RX can be damaged if the total RF input power is higher than +10dBm specified maximum value. Do not connect equipment where the total output power is higher than the specified value of the data sheet or indicated on the LFTX/RX unit.
- In case of a failure do not open the ***sat-nms*** LFTX/RX, you will loose warranty, call SatService GmbH for an RMA number.
- Observe normal safety precautions when operating, servicing, and troubleshooting this equipment.
- Take standard safety precautions with hand and/or power tools.
- When connecting the units fault relay circuits, observe the maximum ratings: 110V D/C 300mA, 125V A/C 500mA.

2.2 Setting the IP Address

Before you can operate the sat-nms LFTX/RX Optical Link, you need to set the unit's IP address. There is a special configuration program on the documentation CD shipping with the unit for this purpose. We recommend to configure LFTX/RX' TCP/IP settings before you install chassis at it's final place. To configure LFTX/RX, the following equipment is required:

- The ***sat-nms*** LFTX/RX L-Band Optical Link itself
- 110…240V A/C power
- A Computer running a Microsoft Windows operating system equipped with CD-ROM drive and Ethernet network card.
- A CAT5 crossover network cable or a Ethernet hub/switch and standard network cables to connect the LFTX/RX and the computer.
- The CD-ROM shipping with the ***sat-nms*** LFTX/RX.

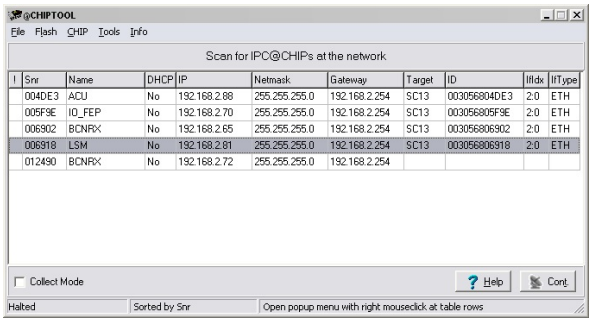
Setting the chassis' IP parameters now is easily done within a few minutes.

1. First install a network cable between the LFTX/RX chassis and your computer. If you have a crossover cable available, this is very easy: simply put the cable into the network connectors of computer and LFTX/RX chassis. Without a crossover cable, you need to connect both, the computer and LFTX/RX chassis to the same network hub or switch using two standard network cables. It is essential, that the computer and the LFTX/RX chassis are connected to the same network segment, the configuration program is not able to find the LFTX/RX chassis through routers or network switches.

2. Now power on your computer and connect LFTX/RX chassis to the 110…240V A/C supply.

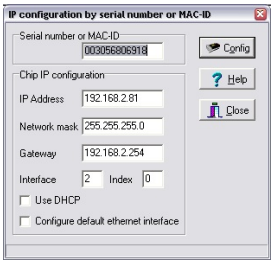
3. Insert the CD-ROM into the computer's drive and inspect it's contents through the 'My Computer' icon on your desktop. Double-click to the 'ChipTool.exe' program in the 'ChipTool' directory.

4. When the ChipTool program is running, type CTRL+F to make the program search the LFTX/RX. The program shows a list containing at least one entry describing the actual network parameters of the LFTX/RX.


@CHIPTOOL
File Flash CHIP Tools Info
Scan for IPC@CHIPs at the network
I Snr Name DHCP IP Netmask Gateway Target ID IfIdx IfType
004DE3 ACU No 192.168.2.88 255.255.255.0 192.168.2.254 SC13 003056804DE3 2:0 ETH
005F9E IO_FEP No 192.168.2.70 255.255.255.0 192.168.2.254 SC13 003056805F9E 2:0 ETH
006902 BCNRX No 192.168.2.65 255.255.255.0 192.168.2.254 SC13 003056806902 2:0 ETH
006918 LSM No 192.168.2.81 255.255.255.0 192.168.2.254 SC13 003056806918 2:0 ETH
012490 BCNRX No 192.168.2.72 255.255.255.0 192.168.2.254
Collect Mode
Help
Cont
Halted
Sorted by Snr
Open popup menu with right mouseclick at table rows

5. The serial number shown in the first column of the list, must match the serial number printed on the processor's enclosure. If the list stays empty, the LFTX/RX chassis is not connected properly. If there are more entries in the list, the configuration program has found other devices in this network segment which use the same technology.

6. Now type CTRL+I to open the IP configuration window of the program. In this form enter the processor's serial number, it's new IP address and network mask. If the LFTX/RX later shall be operated through a router, enter the address of the router on the gateway field, otherwise leave this field blanc. Be sure, that the 'DHCP' mark is unchecked. Finally click to the 'Yes' button to set the new parameters at the LFTX/RX chassis.



Now the IP configuration of the chassis is completed. You may finally want to test if the LFTX/RX chassis is reachable now. Start your web browser and type the chassis' IP address into the URL field of the browser. The LFTX/RX should reply with it's main page, provided that the chassis and your computer are configured for the same subnet.

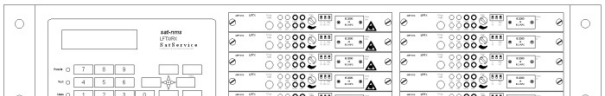
2.3 Mechanical installation

The ***sat-nms*** LFTX/RX enclosure is a standard 2HU 19" rack-mountable enclosure. Use slide bars to install the chassis, because the mounting angles will not be able to hold the chassis in the horizontal position. Fix the enclosure with 4 according screws to a 19" Rack. Don´t forget to connect the "GND"-screw to the Rack.

When planning the mechanical installation of the chassis, please consider that the connectors are placed at the front and the backside of the enclosure. Depending on the flexibility of the cables you are going to use, you will require about 10 centimeters space for cabling on both sides of the chassis.

2.4 Connecting the ***sat-nms*** LFTX/RX

The connectors of the chassis are placed on the front and on the rear side. The Front side contains the fiber optic connectors and the L-Band test-ports, the rear side contains the corresponding L-Band In/Out connectors and also the the AC-power and Data-connectors.



When you connect the L-Band Optical Link chassis, please consider the following:

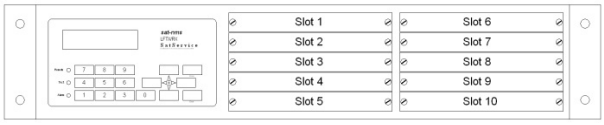
- J1.2 *LAN* is the Ethernet 10Base-T / RJ45 connector. Use a standard network cable to connect the LFTX/RX to an Ethernet hub or switch. If you want to connect your computer and the unit directly without using a hub, you need a crossover cable for this with swapped RX/TX lines.
- J1.1 *serial* is a standard 9-pin RS232 (DCE) SUB-D pin-connector. You may use a direct 9-pin cable to connect a PC to the LFTX/RX. The RTS/CTS and the DTR/DSR lines are bridged in the unit to simulate hardware handshaking. They need however not to be connected, if you want to use a 3 wire cable.
- J1.3 *Alarm* is a standard 9-pin SUB-D socket-connector. This connector contains the alarm contacts of the internal failure relays.
- PS1 and PS2 are the power-inputs. Use only IEC plugs to connect the power supplies. Do not forget to connect the "GND"-labeled screw to the ground potential.
- The input, output and Test-port RF-connectors are all SMA/50Ohm female in the standard configuration.
- The fiber optic connectors are E2000 or FC/APC types depending on the configuration.

2.4.1 Optical receiver and transmitter cards

Attention: Optical Radiation!

If connected to a power supply, the LFTX/RX provides invisible laser radiation. The source is class 3R Laser diode as defined in DIN EN 60825-1:2001-11 with P0=2mW, Lambda=1310nm. Never look into fiber-optical components like connectors or fibers. Use an infrared viewer, optical power meter or fluorescent screen for optical output verification.

It is possible to realize up to 10 optical links with one ***sat-nms*** LFTX/RX chassis.



On the front side of the enclosure, you find 10 slots, where up to 10 cards can be placed in. If the chassis is equipped with the redundancy enhancement, it is possible, to use slot 3 and/or slot 8 as redundant slots. Read chapters Config Parameters and Setup Parameters for instructions how to use this configuration and how to configure the redundancy.

It is possible to place a LFRX or LFTX card in every slot. To install the desired card, put it into the slide rail until the front plate of the card contacts the mounting rail. The card has to slide in smoothly. If not, pull the card out and try again. Otherwise the connectors on the card edge or on the backplane might be damaged. After that fix the card with the provided screws to ensure a proper contacting of the connectors on the LFRX or LFTX card with the connectors on the backplane.

Now you have to configure the system after placing a LFRX or LFTX card. How to do this, is described in chapter Config Parameters.

To release a card, open the screws with which the card is fixed at the mounting rail. Now turn in the screw into the screw thread beside to push the card out of its socket. After that you can pull the card out of the unit.

2.4.2 Power connectors and power supplies

Power connectors

At first, connect the screw, labeled with "GND" to Ground (e.g. to the 19"-Rack the chassis is mounted in).

After that connect the chassis to 110…240V A/C via IEC connectors. The ***sat-nms*** LFTX/RX is running with only one connected power supply as well, but we strongly recommend to use two different power supplies to ensure the maximal system stability. In case of one power supply breaking down, the system will still be running without problems.

Power supplies

Depending on the configuration, the power supplies can be changed during the LFTX/RX chassis is running. To change a power supply, always disconnect the mains of the power supply that has to be changed and wait at least 10s (for internal discharge). Open the 2 screws with which the power supply is mounted an pull the power supply, using the attached handle bar, out of the unit.

To put in a power supply, you have to do the same things in reverse chronology: Put the power supply into the slide rails, until the front plate contacts the mounting rail. After that fix the power supply with the provided screws to ensure a proper contacting of the connectors on the power supply with the connectors on the backplane.

ATTENTION: To avoid the possibility of an electrical shock, never handle with a power supply that is connected to mains.

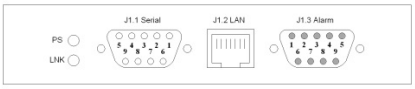
2.4.3 D/C and data connectors

The Alarm and data connectors of the ***sat-nms*** LFTX/RX chassis all are located at the rear side of the enclosure up right. The figure below illustrates the location of the connectors and the pin out.

The LED *PS* shows the presence of one or two power supply(ies). The *LNK* LED turns on, when there is some traffic on the LAN, the chassis is connected to.

To release the MNC board, open the screws with which the card is fixed at the mounting rail. Now turn in the screw into the screw thread beside to push the card out of its socket. After that you can pull the card out of the unit.

To install the MNC board again, put it into the slide rail until the front plate of the card contacts the mounting rail. Please pay attention: The board has to slide in smoothly. If not, pull the card out and try again. Otherwise the connectors on the MNC board or on the backplane might be damaged. After that fix the card with the provided screws to ensure a proper contacting of the connectors on the MNC board with the connectors on the backplane.



J1.1 Alarm connector

Pin	**Alarm contacts (DSUB-9 male)**	
1	NC1	closed if ok, open in fault state
2	COM1	common for fault relay 1
3	NO1	open if ok, closed in fault state
4	not connected	
5	not connected	
6	NC2	closed if ok, open in fault state
7	COM2	common for fault relay 2

8	NO2	open if ok, closed in fault state
9	not connected	

J1.3 Serial connector

Pin	**RS232 serial interface (DCE) (DSUB-9 female**}
1	not connected
2	TxD (output)
3	RxD (input)
4	internally bridged to pin 6
5	GND
6	internally bridged to pin 4
7	internally bridged to pin 8
8	internally bridged to pin 7
9	not connected

J1.2 Network Connector

Ethernet 10/100Base-T (RJ45

2.3.4 RF connectors

On the rear side the in-/ out RF-connectors are placed. Depending, which card is placed in the corresponding slot, the connector is an in- or an output.

If e.g. in slot 1 a LFTX card is placed, the connector I/O 1 is a RF-input. If there is placed a LFRX-card, I/O 1 is a RF-output.

In the standard configuration all RF-connectors are SMA/ 50Ohm female connectors. If you need other connectors e.g. BNC or F or an 75Ohm impedance, contact us, we are able to customize the ***sat-nms*** LFTX/RX.

On the front side of every LFTX or LFRX card you can find a SMA-connector female labeled with *TPout -10dB*. Here it is possible to measure the RF Signal connected to the belonging I/O-connector with an attenuation of 10dB.

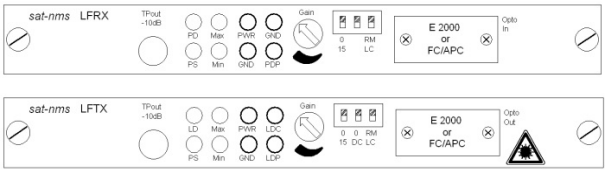
2.3.5 Optical connectors

ATTENTION: Optical Radiation!

If connected to a power supply, the ***sat-nms*** LFTX/RX provides invisible laser radiation. The source is class 3R Laser diode as defined in DIN EN 60825-1:2001-11. P0=2mW, Lambda=1310nm. Never look into fiber-optical components like connectors or fibers. Use an infrared viewer, optical power meter or fluorescent screen for optical output verification.

Depending on the configuration of the LFTX- and the LFRX-cards, E2000 or FC/APC FOL-connectors are used. They are placed on the right side of the cards. Pay attention to the polarity of the connectors. Otherwise the connectors or the fibers might be damaged.

Do not allow any dirt or foreign material to get into the optical connector bulkheads. This may cause damage to the polished optical connector end faces.



For details about the front panel operation of the ***sat-nms*** LFTX optical transmitter card and ***sat-nms*** LFRX optical receiver card please refer to the chapters Local operation LFRX Card and Local operation LFTX Card.

2.4 Configuring the Optical Links

This chapter gives a short overview about some configuration parameters you want to set after you have installed the ***sat-nms*** LFTX/RX. A complete reference of all available setup parameters is given in chapter Setup Parameters.

Chassis and communication type

Select if a chassis is "Master", "Slave" or "Single" Unit. If the chassis is not used as a Single-Unit you have to set the communication-type (HTTP or RS232) and the address of the corresponding Unit (depending on communication type IP or RS232-address).

ATTENTION: If you use 2 ***sat-nms*** LFTX/RX in Master/Slave mode, you have at first to configure and establish the connection between the master and the slave unit. Otherwise all settings in the slave unit will be over-written on accomplishing the Master/Slave communication for the first time. The slave unit will be configured automatically by the master unit in order to ensure correct redundancy-switch function.

Read more about the Master/Slave mode in chapter Setup Parameters.

Redundancy

If your chassis is equipped with the redundancy-switching option, you have choose between "auto", "manual" or "off".

"Auto" switches in case of a LFTX or LFRX card automatically to the redundant card if an fault occurs.

In the "manual" you can manual switch a faulty card to the redundant slot.

"off" disables the redundancy switching.

3 Operation

The ***sat-nms*** LFTX/RX Optical Link is designed to be controlled over a network link using a standard web browser. This means in practice, that the user interface to the unit appears in your browser window after you type in the chassis IP address in the address field of the browser program.

Additional the LFTX/RX gives you the opportunity for local control. For more informations read chapter Front panel Operation.

Operating the ***sat-nms*** LFTX/RX is mostly self-explanatory.

3.1 The Web-based User Interface

After having connected the LFTX/RX chassis to a power supply and set the IP address, you can access the user interface. To do this, start your favorite web browser program (Internet Explorer, Netscape Navigator, Opera or what else Program you prefer). At the address field, where you normally enter the URL of a web page you want to see, type in the IP address of the ***sat-nms*** LFTX/RX chassis you want to control.

The LFTX/RX shows a web page consisting of a navigation bar at the left side of the browser window and the actual readings of the fiber optical links in the main part of the window.

The navigation bar at the left contains seven buttons which build the main menu:

Master Ch. This button switches back to the main page you already see when you connect to the unit. This page displays the actual readings of the master chassis.

Slave Ch. This button switches to a page with the actual readings from the slave chassis, if one is configured.

Config By clicking to this button you switch to the 'Configuration' page where you can view and change the common operational settings of the optical links for the master and slave chassis.

Alarm log The alarm log shows all occurred alarms with time and date.

Setup This button switches to the 'Setup' page which lets you inspect or change less common parameters which usually are set only once to adapt the LFTX/RX to it's working environment.

Info This shows a table with information like the serial number of the device or the revision ID and compilation date of the software.

Help Clicking to this button shows the on-line version of this user manual

3.2 Display Readings

With pressing the *Master Ch.* button, all the parameters of the master chassis are displayed. On the top of the page, you can read the name of the unit, that can be set on the 'Setup' page. Also you can see the state of the 2 power supplies and the frame temperature.

With pressing the *Slave Ch.* button, all the parameters of the slave chassis are displayed in the same way as for the master.

If the communication broke down, you can only see the parameters of the unit on which website you are on. For example the unit on which website you are on is configured as a slave, you can only see the values by pressing the *Slave Ch* button and on the *Master Ch.* page only only a communication fault is displayed.

If the ***sat-nms*** LFTX/RX is configured as 'single' unit, the parameters of this unit are displayed anyway one both pages.

Underneath all the measured parameters of the LFTX or LFRX cards are displayed for every slot. In the first line of every slot-field, you can read the number of the slot whether a LFRX-, a LFTX- or no card is placed to the corresponding slot and the name of this slot. The Name of every slot can be changed in the 'Config' menu. On the right side of every slot field you can see the summary state of the corresponding slot. The following states can be displayed:

Parameter Name	*Description*
OK (green)	All parameters are within the given range, everything is ok.
FLT (red))	One or more parameters is out of range, fault state.
STBY (black))	(Only slot 3 and/or 8) If slot 3 or slot 8 is configured as a redundancy slot, STBY (standby) is displayed when the placed card(s) are in wait-state.
ACT (green)	(Only slot 3 and/or 8) If slot 3 or slot 8 is configured as a redundancy slot, ACT is shown, when the card is working.

3.2.1 Reading of LFRX receiver card

	Slot 2 / RX: Rx2				
F			Opt. I/P Pwr.	0.00 mW	Flt
L	Attenuator	0 dB	RF Pwr.	-90 dBm	Flt
T	Remote	OFF	RF Thresh.	-99 dBm	OK

If a LFRX card is installed, you can read the following parameters:

Parameter Name	*Description*
Attenuator	An integrated attenuator makes is possible to attenuate the RF-signal in 1dB-steps from 0 to 31dB. The selected value is displayed here. If the parameter 'Remote' is 'ON', you can easily change the attenuation value by clicking on it. Now you can select the desired value from a drop-down-box. Pressing the 'Submit'-button applies the new attenuation. If the parameter 'Remote' is 'OFF is is not possible to change this parameter by remote control.
Remote	It is possible to change some settings of the LFRX card remote (e.g. via web browser interface) or local (only on the front panel of the card). The current state of the hardware remote/local switch on the corresponding card is shown here.
Opt. I/P Pwr	This parameter shows the received optical power. The label 'FLT' or 'OK' behind this parameter tells you, if the value is in the range (OK) or not (FLT). The values are given by the LFRX card and can not be changed

RF Pwr	This value shows the output RF power of the LFRX card. The label behind this parameter tells you if the value is in range (OK) or not (FLT). The values are given by the LFRX card and can not be changed
RF Thresh.	The RF threshold is a parameter that can bet set to any value >=-99dBm in the configuration menu. If the current RF power is below the RF threshold it shows a red label (FLT). If the RF power is above the limit it shows a green label (OK).

3.2.2 Reading of LFTX transmitter card

	Slot 7 / TX: Tx7				
O K	RF Pwr.	-90 dBm	Opt. O/P Pwr.	1.45 mW	OI
	Attenuator	15 dB	Diode RF Pwr.	-90 dBm	W
	Remote	OFF	LNB curr.	0 mA	OI

If a LFTX card is installed, you can read the following parameters:

Parameter Name	*Description*
Attenuator	An integrated attenuator makes is possible to attenuate the RF-signal in 1dB-steps from 0 to 31dB. The selected value is displayed here. If the parameter 'Remote' is 'ON', you can easily change the attenuation value by clicking on it. Now you can select the desired value from a drop-down-box. Pressing the 'Submit'-button applies the new attenuation. If the parameter 'Remote' is 'OFF is is not possible to change this parameter by remote control.
Remote	It is possible to change some settings of the LFTX card remote (e.g. via web browser interface) or local (only on the front panel of the card). The current state of the hardware remote/local switch on the corresponding card is shown here.
Opt. O/P Pwr	This parameter shows the transmitted optical power. The label behind this parameter tells you, if the value is in range (OK) or not (FLT). The values are given by the LFTX card and can not be changed.
Diode RF Pwr	This value shows the output RF power of the LFTX cards Laser-diode. The label behind behind this parameter tells you, if the value is in range (OK) or not (Warn). The values are given by the LFRX card and can not be changed. If a 'Warn' is displayed, the summary state of this slot is nevertheless 'OK', because this is not a fault.
LNB curr.	If the chassis is configured to supply LNCs, the actual current is shown here for every slot. The current limits can be changed on the 'Config' menu. If the current is within this range, a green 'OK' is shown, if the value is out of the range, a red 'FLT' is displayed here.

3.2.3 Reading of empty slots

	Slot 5 / empty: Rx5				
O K					

If a slot is empty, besides slot number and slot name no parameters are displayed, the slot-summary-state is always 'OK'.

3.3 Configuration of operational parameters

The page 'Config' contains the operational parameters. Operational parameters are those which are assumed to be changed more frequently than the installation parameters on the Setup page.

The page displays a table with the parameters actually set. Each parameter value is a hyper-link to a separate page which lets you change this parameter. This parameter change page shows the actual parameter setting either in an entry field or in a drop down box. You may change the parameter to the desired value and then click to the 'Submit' button to pass the changed value to the LFTX/RX. The receiver automatically returns to the settings page when the parameter has been changed.

To cancel a parameter modification you already started, either use the 'Back' button of you web browser or click to the 'Config' button on navigation bar. Both returns to the config page without changing the parameter you edited.

You have to change the parameters for every Slot.

ATTENTION! If you use 2 ***sat-nms*** LFTX/RX chassis in master/slave mode, you have at first to configure and establish the connection between the master and the slave chassis. Otherwise all settings in the slave chassis will be over-written on accomplishing the master/slave communication for the first time. The slave chassis will be configured automatically by the master in order to ensure correct redundancy-switch function.

At first you have to set the parameter "Card". Choice "NONE" if no card is placed, "RX" if a LFRX card is placed or "TX" if a LFTX card is placed in the corresponding slot.

3.3.1 Configuration of LFRX receiver card

Red.	Slot 2			
YES	Note	Rx2		
	Card	RX		
	RF Offset	-62 dB	RF Thresh.	-99 dBm

If "RX" is chosen as card type, you can change the following parameters:

Parameter Name	*Description*
Red.	This parameter defines, if in case of failure the card will be replaced by the redundant card. If this parameter is set to 'NO' automatically switchover is disabled for this card. This setting only works, if the parameter 'Redundancy' in the 'Setup' menu is set to 'auto'. The manual redundancy switching is possible whatever this parameter is set to.
Note	You can give every slot a name with up to 18 characters. Click on the Hyperlink (in the picture beyond Rx1), a page to change this parameter will be opened. Type in here the desired slot name and press the submit button.
Card	To change the card-type, click on the field and a new page will be opened. Now choose the

	desired parameter (RX, TX, NONE) from the drop-down-menu and press the submit-button to pass the changed parameter to the chassis.
RF Offset	This parameter is a factory setting, that has not to be changed by the customer. Depending on the LFTX/RX chassis configuration the card has different internal RF attenuation. This value defines the offset to guarantee that the displayed value matches the real values at the I/O-connectors.
RF Thresh.	The RF threshold defines the RF fault level. If the RF level under-runs the threshold, the RF threshold alarm is set. To change the value click on it and enter the new RF threshold and press the submit button. A value of -99dBm disables the threshold check for this card.

3.3.2 Configuration of LFTX transmitter card

Red.	Slot 7			
YES	Note	Tx7		
	Card	TX	LNB DC	OFF
	RF Offset	-38 dB	LNB Curr. min.	0 mA
	Diode RF Offset	-42 dB	LNB Curr. max.	300 r

If "TX" is chosen as card type, you can change the following parameters:

Parameter Name	*Description*
Red.	This parameter defines, if in case of failure the card will be replaced by the redundant card. If this parameter is set to 'NO' automatically switchover is disabled for this card. This setting only works, if the parameter 'Redundancy' in the 'Setup' menu is set to 'auto'. The manual redundancy switching is possible whatever this parameter is set to.
Note	You can give every slot a name with up to 18 characters. Click on the Hyperlink (in the picture beyond Rx1), a page to change this parameter will be opened. Type in here the desired slot name and press the submit button.
Card	To change the card-type, click on the field and a new page will be opened. Now choose the desired parameter (RX, TX, NONE) from the drop-down-menu and press the submit-button to pass the changed parameter to the chassis.
RF Offset	This parameter is a factory setting, that has not to be changed by the customer. Depending on the LFTX/RX chassis configuration the card has different internal RF attenuation. This value defines the offset to guarantee that the displayed value matches the real values at the I/O-connectors.
Diode RF Offset	This parameter is a factory setting, that has not to be changed by the customer. Depending on the LFTX/RX chassis configuration the card has different internal RF attenuation. This value defines the offset to guarantee that the displayed value matches the real values at the I/O-connectors.
LNB DC	LFTX cards are able to power LNCs with 15VDC. This parameter switches the 15VDC to the on or off.
LNB Curr.Min	This parameter defines the LNB current minimum level. In case of under-running this level (e.g. if a cable break occurred) the LNB current alarm will be set.
LNB Curr.Max	This parameter defines the LNB current maximum level. In case of over-running this level (e.g. if a short-circuit occurred), the LNB current alarm will be set.

3.3.3 Empty slots

Red.	Slot 1			
NO	Note	Rx1		
	Card	NONE		

If "NONE" is chosen as card type, you can change the following parameters:

Parameter Name	*Description*
Note	You can give every slot a name with up to 18 characters. Click on the Hyperlink (in the picture beyond Rx1), a page to change this parameter will be opened. Type in here the desired slot name and press the submit button.
Card	To change the card-type, click on the field and a new page will be opened. Now choose the desired parameter (RX, TX, NONE) from the drop-down-menu and press the submit-button to pass the changed parameter to the chassis.

3.4 General Setup

The page 'Setup' contains the ***sat-nms*** LFTX/RX installation parameters. Installation parameters are those which are assumed to be changed less frequently than the operational parameters on the configuration page.

The page displays a table with the parameters actually set. Each parameter value is a hyper-link to a separate page which lets you change this parameter. This parameter change page shows the actual parameter setting either in an entry field or in a drop down box. You may change the parameter to the desired value and then click to the 'Submit' button to pass the changed value to the LFTX/RX. The receiver automatically returns to the settings page when the parameter has been changed.

To cancel a parameter modification you already started, either use the 'Back' button of you web browser or click to the 'Config' button on navigation bar. Both returns to the config page without changing the parameter you edited. The table below lists the settings provided by this page.

Parameter Name	*Description*
General	
Date/ Time	If you want to set the Date and/ or the Time, type the actual Date and Time in the following syntax: YYYY-MM-DD HH:MM:SS It is not possible to change only one of both parameters.
refresh rate	Here you can configure the automatic refresh time for the Master Ch. and the Slave Ch. pages. You can choose between 1s, 3s, 5s and 10s.
Chassis Type	Choose here the chassis type "single", "master" or "slave". In case of using the

	LFTX/RX as "master" or "slave" you have to set additional settings. Please refer to Master/Slave mode parameters.
RS232 baud rate	select here the bit rate for the RS232 Interface. You can choose between 9600, 19200, 38400, 57600, 115200 baud
RS232 address	This parameter defines the communication address to be used with the serial interface. You may select an address 'A' .. 'G' for the packet mode communication protocol or 'NONE' to switch the communication mode to a plain text protocol.
Note	Enter here the Name of the LFTX/RX chassis. This name will be displayed on the top of the 'Master Ch.' or 'Slave Ch.' page. In case of using the LFTX/RX in master/slave mode you can change the master's name with the parameter 'Note Master Unit' and the slave's name with the parameter 'Note Slave Unit'.
Redundancy	Choose between the parameters "auto", "manual" or "off". Please refer to the Redundancy parameters.
SNMP Configuration	
Read Community	Sets the SNMP community string expected for read access. The default is 'public'.
Write Community	Sets the SNMP community string expected for write access. The default is 'public'.
Trap Community	Sets the SNMP community string sent with traps. The default is 'public'.
Trap Destination IP 1	Enter the trap destination IP address (dotted quad notation) to make the unit sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 2	Enter the trap destination IP address (dotted quad notation) to make the unit sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 3	Enter the trap destination IP address (dotted quad notation) to make the unit sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 4	Enter the trap destination IP address (dotted quad notation) to make the unit sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
System Location	The unit replies to MIB-II sysLocation requests with the text entered at this place.
System Contact	The unit replies to MIB-II sysContact requests with the text entered at this place.
User password	Here you can define the password for the 'user' login. Default password is 'user'. When you are logged in as 'user' you are only able to change the parameters on the 'Master Ch.' And the 'Slave Ch.' page. All the other parameters can only be changed when you are logged in as 'admin'
Admin password	Here you can define the password for the 'admin' login. Default password is 'admin'. When you are logged in as "admin" you are only able to change all the parameters of the unit.

3.4.1 Master/Slave mode parameters

ATTENTION: If you use two ***sat-nms*** LFTX/RX chassis in master/slave mode, you have at first to configure and establish the connection between the m aster and the slave chassis. Otherwise all settings in the slave unit will be over-written on accomplishing the master/slave communication for the first time.

The slave unit will be configured automatically by the master unit in order to ensure correct redundancy-switch function.

Parameter Name	*Description*
Master/Slave Comm.	Choose here the communication type between master and slave chassis. You have the choice between 'HTTP' or 'RS-232' depending in this selection, you have to set one of the following settings:
IP corresp. Chassis	In case of selecting the master/slave communication to 'HTTP' you have to type in here the IP address of the corresponding chassis.
Adr corresp. Chassis	In case of selecting the master/slave communication to 'RS-232' you have to type in here the RS 232 address of the corresponding chassis.

3.4.2 Redundancy parameters

If your ***sat-nms*** LFTX/RX chassis is not equipped with a redundancy switching option, you have to choose 'off'. With disabled redundancy slot 3 and slot slot 8 can be used for a common optical link.

Parameter Name	*Description*
Redundancy Definition	Select here intern, extern, intern2 or extern2. If you choose none, no Redundancy is selected.

Intern enable the internal redundancy definition. External means the switching of an external device like a waveguide switch. If you select intern2, the left and the right column of the LFTX/RX chassis will be switched synchronous. The behavior is the same for extern2, but for an external device. Please refer also to Theory of Operation. The external switching is only available on request.

If the automatically redundancy switching is enabled (auto) the LFTX/RX switches automatically to slot 3 if a fault occurs in slot 1, 2, 4 or 5, and to slot 8 if a failure occurs in slot 5, 6, 9, or 10.

If set the redundancy to 'manual' mode, you can switch a card to the corresponding redundant card by yourself. The automatically switching is disabled.

Parameter Name	*Description*
Red. Manual Slot Left	Select here 1, 2, 4, 5 or none. If you choose none, slot 3 is in standby-state. With selecting 1, 2, 4 or 5 you switch the chosen slot to slot 3.

Red. Manual Slot Right	Select here 6, 7, 9, 10 or none. If you choose none, slot 8 is in standby-state. With selecting 6, 7, 9 or 10 you switch the chosen slot to slot 8

3.4.3 Configure the master/slave mode

Using the ***sat-nms*** LFTX/RX in master/slave mode provides the possibility to synchronize two chassis. In this mode, the states and values of the slave is displayed on the master's website and front panel display. And on the slave's website and front panel display the master's values and settings are displayed as well.

It is possible to change the slave's settings via the master unit and vice versa.

For using the redundancy switching option, the units must run in master slave mode in order to ensure the correct function of the redundancy function of the optical link.

To configure the master/slave mode, you have to consider the following order of setup-steps:

Slave unit:

- Set the slave unit to the desired IP address. How to do this is written in chapter Setting the IP address.
- Set the parameter 'Chassis Type' of the future slave unit to 'Slave' see Setup-Page.
- Now select the communication type between master and slave (RS232 or HTTP, see Setup-Page).
- Type in the IP or RS232 address of the corresponding master unit. see Setup-Page

Master unit:

- Set the master unit to the desired IP address. How to do this is written in chapter Setting the IP address.
- Set the parameter "Chassis Type" of the future master unit to "Master". see Setup-Page.
- Now select the communication type between master and slave (RS232 or HTTP, see Setup-Page).
- Type in the IP or RS232 address of the corresponding master unit. see Setup-Page

General:

- Now connect both chassis via IP network or via RS232 cable. The communication fault will no more be displayed. Instead of the communication fault, you can see the settings and the parameters of the corresponding chassis on the website and on the front panel display.
- After that you can do the required configuration of both units. The configuration of the slave will be saved on the slave unit and on the master unit as well.

ATTENTION: If you change the configuration of the slave unit without an existing connection to the master unit, all these settings will be over-written by the Master unit on accomplishing the Master/Slave communication the next time.

3.4.4 Real Time Clock battery backup

The ***sat-nms*** LFTX/RX real time clock is backed up by a gold-cap capacitor. The gold cap supplies the RTC chip with power for several days if the main power is missing. This is the preferred mode of RTC backup for stationary installations of the LFTX/RX.

For applications where the ATNMS LFTX/RX is powered up only occasionally, a lithium cell may be connected inside the chassis in order to provide a permanent buffering of the clock.

3.5 Front panel Operation

The front panel of the ***sat-nms*** LFTX/RX chassis provides a LCD and a small keyboard for operating the device locally.

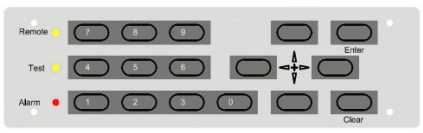
Display The 2-line display normally shows the actual fault-state of every slot and also the 2 power supplies. During menu operation it is used to view and edit each individual parameter of the LFTX/RX. The following screen is shown the first few seconds the unit is running. The lower line shows you the installed software version. You can take a look at the software version on the LFTX/RX website with pressing the *INFO* button as well.

```
sat-nms LFTX/RX
1.012 2007-12-01
```

LEDs

Three LEDs at the front panel signal the summary state of the chassis

- The 'Remote' LED is on while the unit is controlled from a remote computer via network or serial interface. There is no exclusive remote or local lockout mode with the sat-nms LFTX/RX. Local operation of the LFTX/RX is still possible while the device is accessed remotely. The 'Remote' LED is just an information, that someone from remote talks to the device and a local change of parameters may interfere with this.
- The 'Test' LED should not be on during normal operation of the unit. If the 'Test' LED is on, there has occurred a latched fault. A latched fault means, the fault has been there but it doesn't´t exist no longer. So the 'Test' LED is on to inform you that there has occurred a fault. You can see in the 'Alarm log' which fault occurred.
- The 'Alarm' LED is on while the unit is in alarm state. This is the same condition which controls the fault relay output.



Keys

The front panel keyboard provides beside the numeric keys four arrow keys and two keys named ENTER and CLEAR. The general meaning of the keys remains constant through all levels of the menu:

ENTER The ENTER key descends in the menu tree, accepts and stores changed values.

CLEAR The CLEAR key leaves to higher menu levels, abandons changes when editing parameters. It also resets the alarm buzzer when in display mode.

The arrow keys navigate in the menu, in some cases they also increment / decrement values.

0 .. 9 The number keys are to enter numeric parameters.

3.5.1 Display Mode

The display mode shows the actual fault state of all slots and the 2 power supplies in the display. This is the default mode, the LFTX/RX enters it automatically after power on. Depending on the configuration, the default display looks like this:

```
12345678910
-AA0000000 PSOA
```

If the LFTX/RX chassis is used in single mode, the upper display line shows the the number of the slots, the lower line shows the corresponding state of every slot. On the right side the power supply states are displayed. The first character behind *PS* shows the state of power supply 1, the second character represents the state of power supply 2.

In this example, slot 1 is empty, slot 2 and slot 3 are in alarm state, slot 4…10 are on OK-state, power supply 1 is in OK state and power supply 2 is in alarm state.

label	*description*
A	Alarm / Fault
W	Warning
O	[normal O on white ground] OK / no fault
[O]	[negative O on black ground] now OK but a latched faults exists - if a failure occurred and disappeared again. You can reset this ‚negative' O to a ‚normal' O with clearing the latched faults.
-	no card installed in this slot.

If the LFTX/RX chassis is used in master/slave configuration, the display shows the state of both units: the upper line belongs to the chassis you are looking at, the lower line belongs to the corresponding unit.

```
12345678910
-AA0000000 PSOA
```

The first character shows, if the unit is configured as master *M* or as slave *S*. The following characters show the states of every slot from slot 1 to slot 10 and the state of the 2 power supplies.

In this example, the unit you are looking at is a master unit, slot 1 is empty, slot 2…4 are in fault state, slot 5 …8 and slot 10 are in OK state, slot 9 is in warning state. The power supply 1 of the master is OK and power supply 2 in alarm state.

In the corresponding slave unit slot 1 us empty, slot 9 has a warning and all other slots and the power supplies are OK.

If a communication fault between master and the slave chassis occurred, **COMM FAULT** is displayed in the lower line.

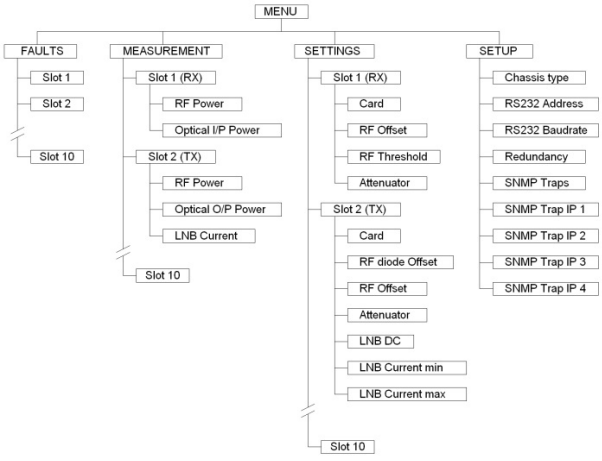
```
M-AAA0000WO PSOA
 * COMM FAULT *
```

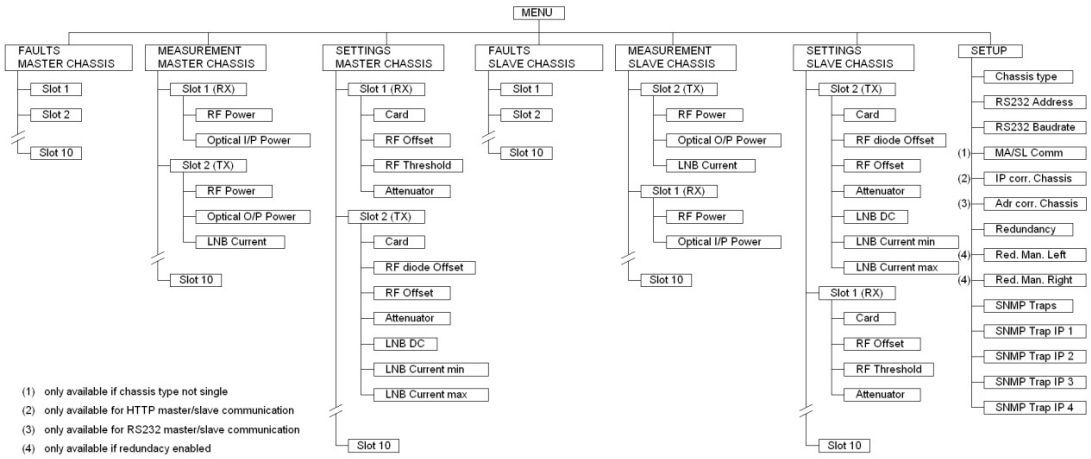
3.5.2 The Main Menu

The menu mode lets you view and change settings of the ***sat-nms*** LFTX/RX. From the display mode, you enter the menu by pressing the ENTER key. To leave the menu, repeatedly press the CLEAR key until the display screen appears again. If there are no keystrokes for 2 minutes, the unit automatically leaves the menu and returns to display mode.

Depending if a slot is configured as a RX or TX slot, the structure changes in some parameters. The following diagrams shows both possibilities (Slot 1 -> RX, Slot 2 -> TX).

The menu structure depends also if the chassis is configured in single or in master/slave mode. The structure is shown in the two diagrams below. The first one shows the menu structure of a single unit, the second shows the structure of a master/slave unit.





The *FAULT* sub menu shows you the state of every slot. The *MEASUREMENT* sub menu gives an overview over the actual measurement values for every slot. The *SETTINGS* sub menu lets you view and modify the operational parameters of the LFTX/RX. The *SETUP* sub menu contains a number of parameters which usually only need to be changed during the installation of the optical link.

For further information about the parameters see the chapters Operational Parameters and Installation Parameters of this manual.

To navigate in the menu, use the ◄ ► or ▲ ▼ keys to select a sub menu, then press ENTER to descend in the selected menu branch. Pressing CLEAR ones returns to the main menu level, pressing it twice returns to display mode.

3.5.3 Editing Numeric Parameters

To change a numeric parameter like the the RF offset, select this value from the *SETTINGS* menu. The upper display display line describes the parameter, the lower line shows it's value:

```
RF Offset
          -62 dB
```

To set a new value, press ENTER. This clears all figures from the value display and shows '>_' at the first column to signal the editing mode.

```
RF Offset
>_             dB
```

Using the number keys, you enter the new value. The digits fill the entry field from right to left, like with a pocket calculator. The ▲ ▼ keys enable you to write a ‚dot' or a ‚minus'. The ◄ key may be used to delete the last digit.

```
RF Offset
>-50_          dB
```

To accept the edited value, press ENTER. This checks the entered value against it's limits and executes the parameter change. Pressing CLEAR twice (the first key press clears the display) leaves the editing mode without changing anything.

3.5.4 Editing Multiple Choice Parameters

To change a numeric parameter like the RS232 interface baud rate, select this value from the *SETTINGS* menu. The upper display line describes the parameter, the lower line shows it's value:

```
Attenuator
(RF-90dBm)  31dB
```

To set a new value, press ENTER. This changes to the editing mode, signaled by a '>' character in the first column. Use the ◄ ► or ▲ ▼ keys to change the value.

```
Attenuator
>31_           dB
```

To accept the changed value, press ENTER. Pressing CLEAR leaves the editing mode without changing the value.

3.5.5 Fault Display

The fault display page lets you view the actual state of all fault flags and also the latches state of these flags.

```
MENU:FAULTS
```

From the main menu, select *FAULTS* and press ENTER to see the faults display. The fault states are represented by a 2-character memnotic.

label	*description*
OK	Parameter ok
WN	Warning state

AL	Alarm state, parameter out of range

The example below shows two examples of a faults display page.

```
SLOT 1    OpP: AL
RFP: AL   TRH: OK
```

The first example shows the Fault Display of a LXRX card. The following parameters are shown:

Parameter	*Description*
SLOT 1	Number of the slot, which faults are shown actually
OpP	Optical input power state, here an alarm is displayed
RFP	State of the RF output power, here an alarm is displayed
THR	Shows, if the RF power is in range of the user-defined threshold, here an ok state is displayed.

```
SLOT 2    LsD: AL
RFP: WN   LNC: OK
```

The second example shows the Fault Display of a LFTX card. The following parameters are shown:

Parameter	*Description*
SLOT 2	Number of the slot, which faults are shown actually
LsD	Shows, if the laser diode is working, here an alarm is displayed
RFP	State of the RF input power, here a warning is shown
LNC	Shows, if power consumption of the LNC is within the user-defined range. Here an ok state is displayed.

If no card is placed to a slot, only *empty* is displayed in the fault menu.

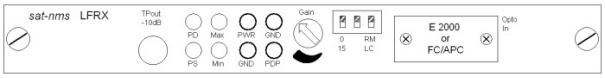
```
SLOT 3
   * empty *
```

When you press the ENTER key during the LFTX/RX shows the fault state of a slot, you will be ask whether to reset the latched faults. To acknowledge this, press ENTER. To leave the fault display without resetting the latched faults, press CLEAR.

```
 ENTER resets
 latched faults
```

3.5.6 Local operation LFRX Card

The following picture shows you the front view of a LFRX card.



Depending on the card configuration, the 'Opto In' connector is an E2000 or a FC/APC connector. Connect here the optical fiber which signal should be received.

The following indicator LED's are located on the cards front panel:

Name	*Description*
PD	This (green) LED shows the state of the receive pin-diode. The LED turns on, if there is an optical input connected to this card.
PS	The (green) PS-LED displays the power supply state of the card. The LED is on, if the power supply of the card is working.
Max	The (yellow) Max-LED turns on, if the optical input power is below the recommended level.
Min	The (yellow) Min-LED turns on, if the optical input power is above the recommended level.

You have the possibility to change the following parameters:

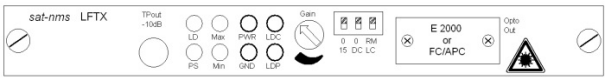
Parameter	*Description*
Gain	An integrated attenuator makes is possible to attenuate the RF-output-signal in 1dB-steps from 0 to 31dB. This switch has 16 steps. Use this switch to select the attenuation range to 0 …15dB or 16…31dB.
0..15	By setting this switch, you define the range of attenuation, that can be set by the gain switch. In the *0* position, it is possible to set the attenuator from 0…15dB, in the *15* position, the attenuation value can be set from 16…31dB.
RM..LC	This DIP-switch defines, if the card is controlled remote *RM* or local *LC*. If the switch is in the *LC* position, it is not possible, to change the parameters of this card via remote Inferface (IP, RS232, SNMP) or via the front panel keyboard of the LFTX/RX chassis.

Additionally you can measure the following parameters:

Parameter	*Description*
T P o u t - 10dB	The testport gives you the opportunity to measure the RF-Level on the Front panel. The Signal, that you can measure here is about 10dB lower than the output signal on the back side of the LFTX/RX chassis
PWR	Here you can measure the level of the RF power. The scaling is 50mV/dB
GND	Reference Ground for the PWR measurement.
GND	Reference Ground fort he PDP measurement
PDP	Here you can measure the optical input power. 100mV relates to 100uW.

3.5.7 Local operation LFTX Card

The following picture shows you the front view of a LFTX card.



Depending on the card configuration, the 'Opto Out' connector is an E2000 or a FC/APC connector. Connect here the optical fiber to transmit the optical signal.

The following indicator LED's are located on the cards front panel:

Parameter	*Description*
LD	This (green) LED shows the state of the TX laser diode. The LED turns on, if the laser diode is working.
PS	The (green) PS-LED displays the power supply state of the card. The LED is on, if the power supply of the card is working.
Max	The (yellow) Max-LED turns on, if the RF input level is below the recommended level.
Min	The (yellow) Max-LED turns on, if the RF input level is above the recommended level.

You have the possibility to change the following parameters:

Parameter	*Description*
Gain	An integrated attenuator makes is possible to attenuate the RF-input-signal in 1dB-steps from 0 to 31dB. This switch has 16 steps. Use the *0..15* switch to select the attenuation range to 0 …15dB or 16…31dB.
0..15	By setting this switch, you define the range of attenuation, that can be set by the gain switch. In the *0* position, it is possible to set the attenuator from 0…15dB, in the *15* position, the attenuation value can be set from 16…31dB.
0..DC	If your card is equipped with this functionality, you can switch here the 15VDC on and off to supply a LNC connected to the RF in of this slot. In the *0* position of the switch, 15VDC is off, in the *DC* position, the 15VDC is on.
RM/LC	This DIP-switch defines, if the card is controlled remote *RM* or local *LC*. If the switch is in the *LC* position, it is not possible, to change the parameters of this card via remote Inferface (IP, RS232, SNMP) or via the front panel keyboard of the LFTX/RX chassis.

Additionally you can measure the following parameters:

Parameter	*Description*
TPout -10dB	The testport gives you the opportunity to measure the RF-Level on the Front panel. The Signal, that you can measure here is about 10dB lower than the output signal on the back side of the LFTX/RX chassis.
PWR	Here you can measure the level of the RF power. The scaling is 50mV/dB
GND	Reference Ground for the PWR, LDC and LDP measurement.
LDC	Here you can measure the current consumption of the laser diode. 100mV relates to 10mA.
LDP	Here you can measure the optical power. 100mV relates to 100uW.

4 Remote Control

The ***sat-nms*** LFTX/RX L-Band Optical Link chassis may be controlled remotely by a monitoring and control application either through the TCP/IP interface or through a serial RS232 interface. Both communication methods use the same commands and parameters, however, there are different frames around each message depending communication method used. The third method is SNMP.

Controlling the device from the web interface, the TCP/IP remote control interface, the SNMP interface or via the serial interface is completely equal, commands may sent to any interface at any time, the LFTX/RX will use the parameter it receives last.

4.1 General command syntax

The LFTX/RX knows a number of parameters, each identified by a parameter name. To set a certain parameter to a new value, a message:

name=value

has to be sent to the device. The LFTX/RX interprets this command, checks the range of *value*, sets the internal parameter and then answers:

name=value

The *value* in the reply is the value actually recognized by the device. For instance, if the requested value was out of range, the replied (and internally used) value is limited to the applicable minimum or maximum.

To read a parameter from the LFTX/RX, instead of a new parameter value a question mark is sent:

name=?

The device replies the actual value in a complete message:

name=value

A complete list of the parameter the ***sat-nms*** LFTX/RX knows is shown later in this document in chapter Parameter list. Below, some common rules applying to the remote control message syntax are summarized.

- Parameter names always are of lower case letters, most of them are four characters long.
- Non-numeric parameter values always are written in upper case.
- Numeric (floating point) values may be specified with an arbitrary precision, however the device will reply only a fixed number of places. The LFTX/RX recognizes a decimal point ('.'), numbers must not contain any commas.
- There must not be any whitespace in front or after the '=' in a message.
- If the command/query is not of the form **name=value** or **name=?**, the LFTX/RX replies the message **?SYNTAX**.
- If the message syntax is OK, but contains an unknown parameter name is used, the reply is **? UNKNOWN**
- Numeric parameters are cut to the limits defined for this particular parameter.
- Misspelled choice values cause the LFTX/RX to set the first value of the choice list.
- Assigning a value to a read-only parameter will cause no fault, however the LFTX/RX will overwrite this parameter immediately or some seconds later with the actual value.

4.2 The TCP/IP remote control interface

Controlling the ***sat-nms*** LFTX/RX Optical Links through the network is done by means of HTTP GET requests. Setting parameter values or querying readings or settings, all is done by requesting HTTP documents from the unit. The message *to* the LFTX/RX thereby is coded into the URL as a CGI form parameter. The device replies a one line document of the MIME type 'text/plain'.

The document name for remote control is **/rmt**, hence (assuming the LFTX/RX is listening to the IP address 10.0.0.1), requesting a document with the URL

http://10.0.0.1/rmt?sver=?

will let the LFTX/RX reply the software version in a one line text document:

sver=1.012 2007-12-01

This way all parameters may be queried or set, you may use your favorite web browser to try out the remote control of the LFTX/RX manually.

4.3 The RS232 remote control interface

Beside the network interface, the ***sat-nms*** LFTX/RX also provides an RS232 serial port which can be used to control the device remotely. Depending on the device address set, the LFTX/RX either runs framed protocol with start/stop characters and checksum or it provides a dumb terminal interface. The RS232 interface operates by default at 9600 baud, no parity, 8 data bits, one stop bit.

You can configure the baud rate on the front panel.

If an address 'A' .. 'G' is selected, the LFTX/RX expects each message it receives to be packed into a frame as described below.

char #	*example*	*description*
1	{	start character, always '{'
2	A	device address (A..G)
3	t	first character of the message body
.	m	message body ...
.	p	..
.	0	..
.	=	..
n-1	?	last character of the message body
n	}	end character, always '}'
n+1	.	checksum

The checksum byte is calculated using an algorithm as implemented by the following formula:

$$sum = 32 + \left(\sum_{i=1}^{n} (byte[i] - 32) \right) \text{ modulo } 95$$

This protocol type is known as *MOD95-* or *Miteq protocol*. The LFTX/RX also packs it's reply in a protocol frame as described above. incomplete frames, checksum errors or address mismatches let the device ignore the message. The time between the characters of a message must be less than 5 seconds or the device will treat the message as incomplete.

If the LFTX/RX is set to the device address 'NONE', it uses a simple line protocol instead of the framed protocol described above. Messages sent to the device have to be terminated with a carriage return character (ASCII 13), the device terminates replies with a CR/LF pair (ASCII 13/10). There is no echo for characters entered, hence this protocol easily may be used for computer based remote control.

4.4 SNMP Control

The ***sat-nms*** LFTX/RX contains an SNMP agent listening at UDP port 161. The SNMP agent provides a common subset pf the MIB-II system / interface parameters and gives full access to the remote control capabilities of the LFTX/RX with a number of MIB objects placed in the private.enterprises tree.

The actual MIB file defining the ***sat-nms*** LFTX/RX Optical Link private MIB may be downloaded from the unit itself by FTP (user 'service', password 'service'). The file 'LFTXRX.MIB' contains all necessary information. A link to this MIB file is also included in the web interface on the 'setup page'.

4.5 Parameter list

The table below shows the complete list of M&C parameters the ***sat-nms*** LFTX/RX chassis knows. For each parameter the valid range and a short description is given.

If the LFTX/RX chassis is configured as *single unit*, use the commands which designated for the master chassis. The commands for slave chassis are not valid.

In master/slave mode each chassis could give you all information for both units. So normally a M&C system will communicate only with one chassis (e.g. the master) and gets all information about master and slave from this unit.

Common status queries and commands

name		. range/format	*description*
addr	r/o	A,B,C,D,E,F,G,none	RS232 communication address
alrm	r/o	[see below]	Faults master chassis
alrs	r/o	[see below]	Faults slave chassis
atpm	r/o	[card1],..,[card10] : 0,1	Attenuator present for master chassis slots (1=installed, 0=not installed)
atps	r/o	[card1],..,[card10] : 0,1	Attenuator present for slave chassis slots (1=installed, 0=not installed)
attm	r/w	[card1],..,[card10] : 0..31	Attenuator settings in dB for master chassis slots
atts	r/w	[card1],..,[card10] : 0..31	Attenuator settings in dB for slave chassis slots
baud	r/o	DISABLED,9600,19200,38400,57600,115200	Interface baudrate
clft	o/w	1	Clear latched faults
diom	r/o	[card1],..,[card10] dB	Diode RF Offset for master chassis slots
dios	r/o	[card1],..,[card10] dB	Diode RF Offset for slave chassis slots
divm	r/o	[card1],..,[card10] dBm	Diode RF Power for master chassis slots
divs	r/o	[card1],..,[card10] dBm	Diode RF Power for slave chassis slots
lnbm	r/o	[card1],..,[card10] : OFF,ON	LNB DC supply for master chassis slots
lnbs	r/o	[card1],..,[card10] : OFF,ON	LNB DC supply for slave chassis slots
lnim	r/o	[card1],..,[card10] mA	LNB current minimum limit for master chassis slots
lnis	r/o	[card1],..,[card10] mA	LNB current minimum limit for slave chassis slots
lnvm	r/o	[card1],..,[card10] mA	LNB current for master chassis slots
lnvs	r/o	[card1],..,[card10] mA	LNB current for slave chassis slots
lnxm	r/o	[card1],..,[card10] mA	LNB current maximum limit for master chassis slots
lnxs	r/o	[card1],..,[card10] mA	LNB current maximum limit for slave chassis slots
notm	r/o		Description/Note master chassis
nots	r/o		Description/Note slave chassis
nslm	r/o	[card1],..,[card05]	Description/Note left cards of the master chassis
nsls	r/o	[card1],..,[card05]	Description/Note left cards of the master chassis
nsrm	r/o	[card6],..,[card10]	Description/Note right cards of the master chassis
nsrs	r/o	[card6],..,[card10]	Description/Note right cards of the master chassis
plcm	r/o	[card1],..,[card10] : RX,TX,NONE	Card type of master chassis slots
plcs	r/o	[card1],..,[card10] : RX,TX,NONE	Card type of slave chassis slots
povm	r/o	[card1],..,[card10] uW	Optical input power (LFRX) or output power (LFTX) of master chassis slots
povs	r/o	[card1],..,[card10] uW	Optical input power (LFRX) or output

			power (LFTX) of slave chassis slots
rdlu	r/w	manual,auto,off	Redundancy setting card 1-5 (left)
rdru	r/w	manual,auto,off	Redundancy setting card 6-10 (right)
rdsw	r/w	0,1	Redundancy switched indication (1=has switched, clear with set to 0)
redc	r/w	[card1],..,[card10] : YES,NO	Redundancy setting for each individual slot/card
redd	r/o	none,intern,extern,intern2,extern2	Installed redundancy type / backplane
redl	r/w	1,2,4,5,NONE	Redundancy position of left slots
redr	r/w	6,7,9,10,NONE	Redundancy position of right slots
refr	r/o	1,3,5,10	Refresh Rate (secs)
remm	r/o	[card1],..,[card10] 0,1	Remote (1) or Local (0) setting of each card of master chassis
rems	r/o	[card1],..,[card10] 0,1	Remote (1) or Local (0) setting of each card of slave chassis
rfom	r/o	[card1],..,[card10] dB	RF RF Offset for master chassis slots
rfos	r/o	[card1],..,[card10] dB	RF RF Offset for slave chassis slots
rfvm	r/o	[card1],..,[card10] dBm	RF Power for master chassis slots
rfvs	r/o	[card1],..,[card10] dBm	RF Power for slave chassis slots
snom	r/o		Device serial no master chassis
snos	r/o		Device serial no slave chassis
stim	o/w	YYYY:MM:DD hh:mm:ss	Set date / time
svrm	r/o		Software version master chassis
svrs	r/o		Software version slave chassis
thrm	r/w	[card1],..,[card10] dBm	RF Threshold for master chassis slots
thrs	r/w	[card1],..,[card10] dBm	RF Threshold for slave chassis slots
time	r/o	YYYY:MM:DD hh:mm:ss	Date / time
tmpm	r/o	°C	Temperature master chassis
tmps	r/o	°C	Temperature slave chassis

Master/Slave related commands

adex	r/o	A,B,C,D,E,F,G,NONE	Adr corresp. Chassis
coex	r/o	HTTP,RS-232	Type of master/slave Communication
ipex	r/w	aaa.bbb.ccc.ddd	IP corresp. Chassis
unit	r/w	Master,Slave,Single	Chassis Type

SNMP related commands

sdes	r/o		SNMP System description
scon	r/w		SNMP System contact
snam	r/w		SNMP System name
sloc	r/w		SNMP System location
rcom	r/w		SNMP read community
wcom	r/w		SNMP write community
tcom	r/w		SNMP trap community
autr	r/w	enabled,disabled	SNMP enable Auth traps
ipt1	r/w	aaa.bbb.ccc.ddd	SNMP Trap IP 1
ipt2	r/w	aaa.bbb.ccc.ddd	SNMP Trap IP 2
ipt3	r/w	aaa.bbb.ccc.ddd	SNMP Trap IP 3
ipt4	r/w	aaa.bbb.ccc.ddd	SNMP Trap IP 4

Fault Message

The commands 'alrm' and 'alrs' return a text string which shows the fault status of the master or slave chassis.

Syntax: S[power supply faults]R[rf faults]O[optical faults]L[lnb faults]T[threshold faults]C[communication fault][internal fault][switch fault]

The *power supply faults* list contains 2 characters for power supply 1 to 2. The *rf faults*, *optical faults*, *lnb faults* and *threshold faults* lists contains 10 characters, representing the 10 slots of a ***sat-nms*** LFTX/RX chassis. The *communication fault* contain 1 characters. The unit sets the fault if the communication to the corresponding chassis is not possible. This fault flag is only valid, if the LFTX/RX chassis is configured for master/slave mode. The *internal fault* shows that there is a problem with the internal communication between different components of one ***sat-nms*** LFTX/RX chassis. The unit sets the *switch fault* if there are problems with the internal or external (e.g. wave-guide} switches for the redundancy switching.

The meaning of the fault characters are: 0 means OK and 1 means FAULT.

http://192.168.2.81/rmt?alrm=?

alrm=S10R0000100001O0000000000L0000000000T0000000000C000

The example shows an master chassis, where the following alarms are active: power supply 1, rf fault of slot 5 and 10.

Please keep in mind, that not all slots have to be equipped with LFRX or LFTX cards and the empty slot may show a fault.

Measurement and setting lists

Some commands returns a comma separated list of measurements or settings for all slots of a chassis. So

you get 10 values at ones.

http://10.0.0.1/rmt?powm=?

This returns for each slot of the (master) chassis the optical power level. Empty slots are marked with -.

povm=-,-,1458,-,1466,-,-,1454,-,1454

Plugged/unplugged Cards

The commands 'plcm' and 'plcs' return a comma separeted list of the state of all boards.

http://10.0.0.1/rmt?plcm=?

This returns for each slot the configured card type. In this example are slot 1-5 are configured a receiver, 6-8 as transmitter and 9-10 are empty. Please keep in mind, that the LFTX/RX chassis does not detect what kind of card is installed. The return value of the function shows you what the user has configured for each slot.

plcm=RX,RX,RX,RX,RX,TX,TX,TX,NONE,NONE

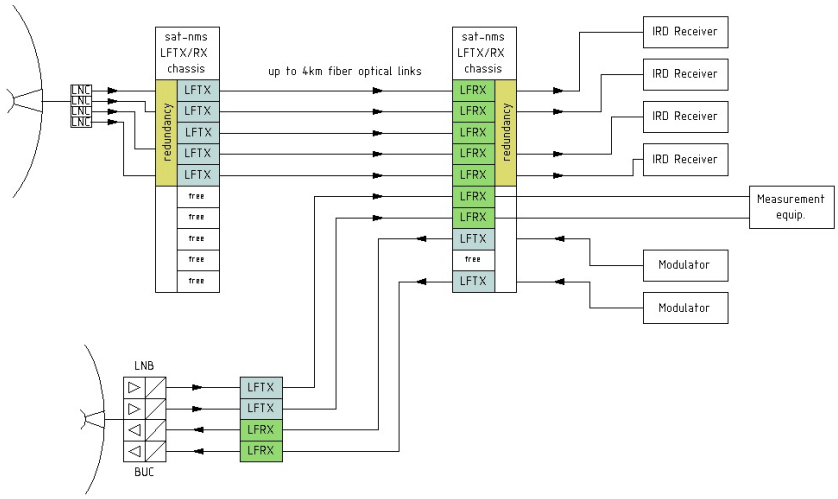
master/slave mode

The following table shows the which parameters are available for LFRX and LFTX cards

Parameter	*LFRX*	*LFTX*
description/note	rx	tx
RF Threshold	rx	
Attenuator	rx	tx
LNB Power		tx
RF Power	rx	tx
Diode Power		tx
Optical Power	rx	tx
LNB Current		tx
RF Fault	rx	tx
Optical Fault	rx	tx
LNB Fault		tx
Threshold Fault	rx	

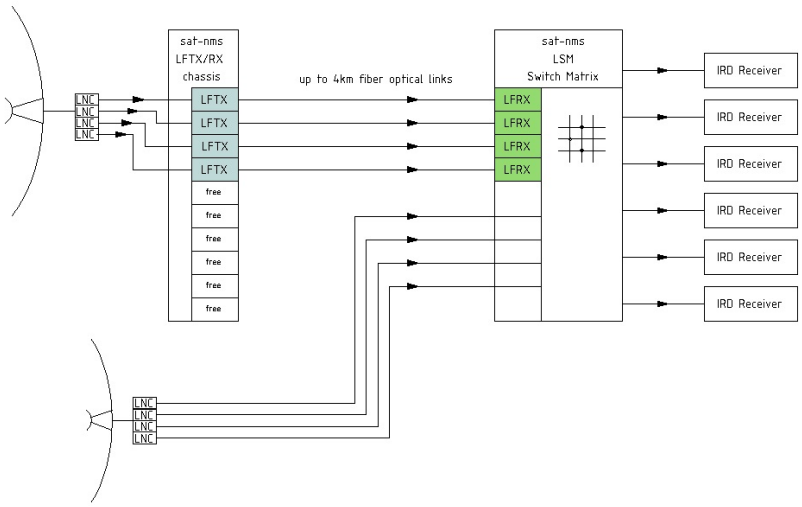
5 Theory of Operation

The ***sat-nms*** L-Band optical transmitters and receivers were developed to cover all applications in the field of satellite communication, satellite ground stations, VSAT and cable networks. The following block diagram shows a typical scenario of a teleport. The LNCs at the different antennas provide L-Band output signals which have to be routed via long cable runs from the antennas to a central site, in this case a switch matrix. The optical transmitter converts the analog L-Band spectrum (or any other RF spectrum in the specification of the different modules) with the help of a laser diode to a optical output signal with a wavelength of 1310nm. This is the standard wavelength used by most of the laser diodes. But it is also possible to select another wavelength on request by selecting another laser diode.



This example shows a satellite receive and transmit application with two antennas and at different locations, but with one ***sat-nms*** LFTX/RX chassis which handles all signals from both antennas and the uplink signal to the second antenna. In this case the satellite modulator delivers its L-Band or 70MHz signal to the optical transmitter located for example in the central building and at the end of the optical fiber link a optical receiver regenerates the RF signal spectrum which can be delivered for example to a block up-converter (BUC).

As already explained in this TX application it is also possible to provide the 10MHz reference frequency for the BUC via the same optical link. You can see in this block diagram also the redundant configuration of the receive path from the first antenna.



The second block diagram show the combination of the ***sat-nms*** LSM L-Band Switch Matrix with the ***sat-nms*** LFRX L-Band Fiber Optical Receivers. So you use the LFRX card directly in our switch matrix.

5.1. Frequency bands

While the fiber optical links where designed by SatService GmbH mainly for the transmission of the satellite L-Band frequency band (950 to 2150MHz) also a broadband version from 50MHz to 2150MHz is available. So this link type can also be used to transmit the traditional 70 or 140MHz IF bands of satellite ground stations and a microwave links. But also other terrestrial applications are feasible like the transmission of GSM signals in the 800 and 1800MHz frequency bands.

sat-nms LFRX-L and LFTX-L	950 to 2150MHz
sat-nms LFRX-B and LFTX-B	50 to 2150MHz
sat-nms LFRX-10 and LFTX-10	950 to 2150MHz and 10MHz reference frequency for BUC

As a unique feature the ***sat-nms*** LFTX/RX modules can transmit L-Band and 10MHz signals together on

one single fiber connection. This is a growing application for VSAT and satellite ground station transmit chains which make use of Block Up-Converter (BUC). These BUCs very often need a 10MHz reference frequency signal for their internal local oscillators. This is generated within the satellite modem and also transmitted via the coaxial L-Band output.

The ***sat-nms*** LFTX/RX fiber optical link can transmit this combined/multiplexed frequency signals. Each fiber optical link (FOL) consists of two destinations which are interconnected via a fiber optical cable. On one side of the link is the optical transmitter and on the other side is the optical receiver. Both modules are Euro card sized (100x160mm) printed circuit boards which are plug into a 2U 19" chassis. The chassis includes a redundant power supply, two backplanes to connect to the modules, an M&C printed circuit board and at the front panel a keyboard and display as local user interface. Each chassis can contain 10 of the optical link modules in any combination whether they are optical transmitters or receivers.

The ***sat-nms*** LFTX/RX optical link is a broadband device and transmits transparently the complete RF spectrum from one site to the other. All modulation formats, whether they are analog or digital, can be transmitted transparently. The RF signal is directly modulated on to a high performance laser diode and adds no phase noise or frequency instability to the original signal. The result is a very good signal quality.

Due to the very stable design of the optical transmitter and receiver electronics there is no need for an Automatic Gain Control (AGC) within the circuits. So the link is compared to other vendor's solution really transparent. Certainly a Manual Gain Control (MGC).function is included which can be also adjusted from remote in a wide range of 30dB.

The optical transmitter module always provides also LNC supply voltage including current monitoring and RF level detection.

We tried to realize all functionality in the baseline product so that you don't have to care about options. So LNC powering and other features are always included wherever possible. This is only not the case in the broadband and 10MHz boards as this makes no sense here in any case and the inductors of the LNC voltage supply would destroy low frequency performance.

5.2 Connectors

For the optical interface SatService provides E2000 connectors from Diamond or Huber & Suhner by default. But we are also in a position to deliver on request FC/APC or other single mode connectors. The optical interface is located at the front panel of the 19" chassis because the optical patch panels are most likely also at the front of a 19" rack. The connectors are slightly shifted back wards from the normal front plane of the 19" drawer, so that they don't interfere at the front of the rack nor can they become destroyed or snapped off.

5.3 Controller Module

The Controller Module of the ***sat-nms*** LFTX/RX is based on a separate 100x160mm printed circuit board. It performs the following functions:

- Monitor and control the optical transmitter cards LFTX
- Monitor and Control the optical receiver cards LFRX
- Manage the redundancy switching in master/slave mode
- Control the keyboard and display at the unit
- Control the Remote Interfaces (RS232 and LAN)

The design of the monitoring & control board is based on the same controller with integrated web server which SatService has successfully used in all other products of the ***sat-nms*** family as well. The chip has the following advantages:

- Real Time Operation System with FTP, HTTP, SNMP over TCP/IP
- Serial Interfaces
- No external RAM and ROM components
- 10BaseT RJ45 Interface

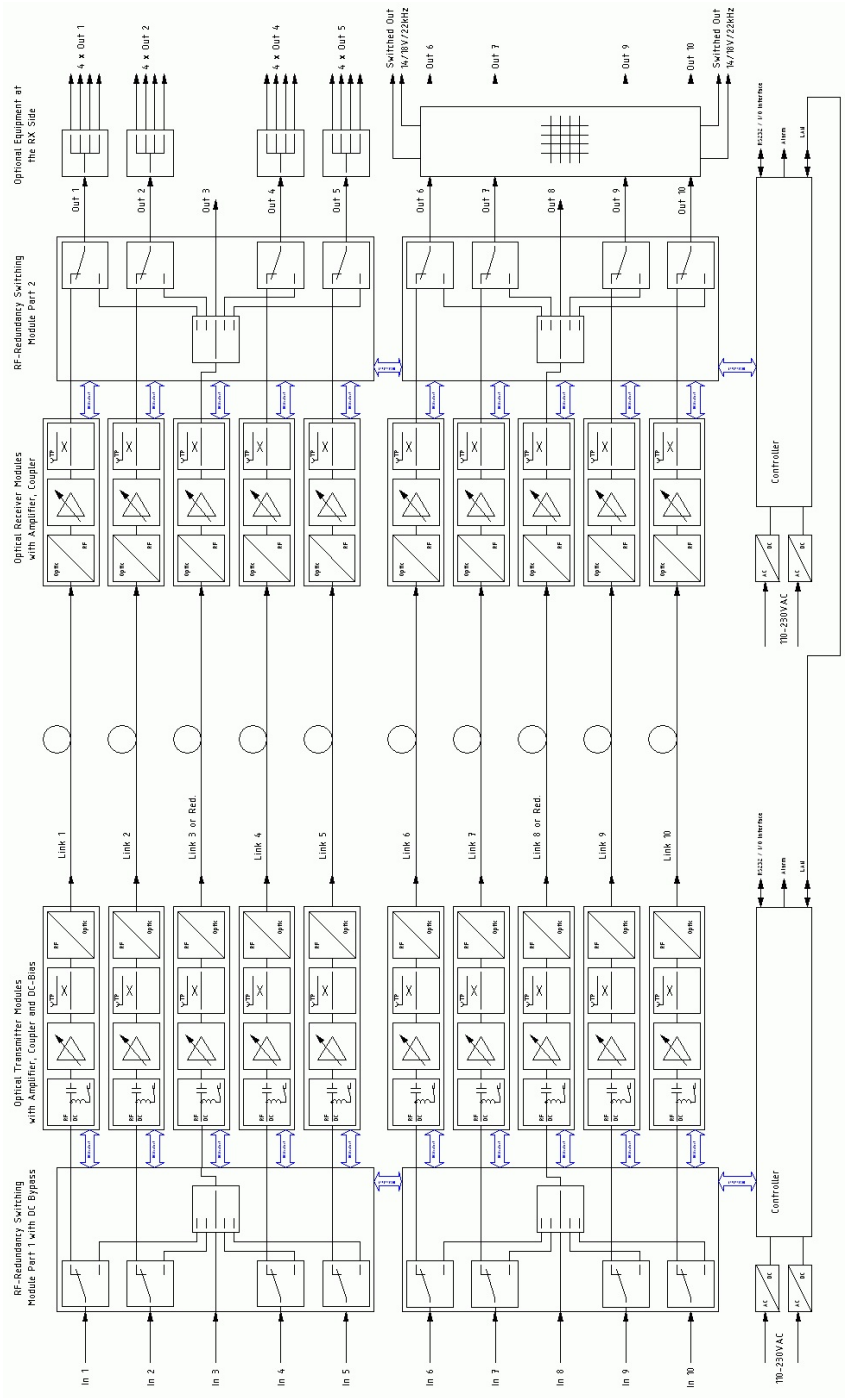
5.4 Redundancy switching

A novel and additional feature of the ***sat-nms*** LFTX/RX system is the capability to switch complete optical links and restore operation within a second if one of the optical links gets defective. This can effectively increase the availability of optical transmission systems. In order to provide this feature the LFTX/RX chassis can be equipped with a different internal back-plane which includes the necessary L-band switches and the software with redundancy switching capability.

A common applications example is a connection of a Ku-Band antenna which normally provides 4 L-band outputs from 4 LNCs (11/12GHz and Horizontal/Vertical) to a central building or a teleport. In this case a 5th module will be integrated in both the optical transmitter and the optical receiver chassis on both sides of the link. All 5 links will be monitored and controlled via the M&C module in the master chassis. The two M&C modules talk to each other via TCP/IP and one is the master module which initiates the redundancy switching. The master module provides also the M&C information for the slave module so that the operator does have all information available from both if he is in front of the units or if he operates the unit via the web browser interface. If one optical link gets defective - for what ever reason, e.g. a faulty module or the optical fiber cable is cut - the redundancy switching will be initiated in both chassis from the master M&C module.

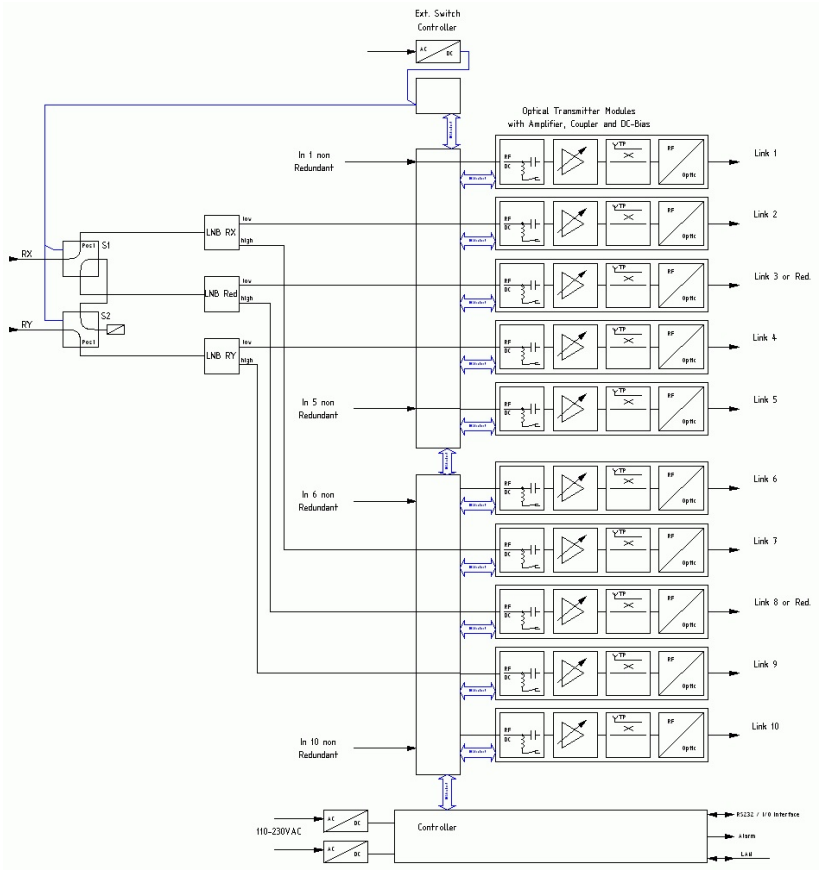
The redundancy switching capability is defined by the back plane in the ***sat-nms*** LFTX/RX chassis and how the switches are route internally in the backplane. The principle is that the two columns are two separate redundancy combinations which are internally interconnected by L-Band switches. So each column itself will provide redundancy, where in slot 3 and 8 the redundant modules will be plugged.

This configuration will be defined in the setup page of the M&C software via the web browser interface. So per 19" chassis with its maximum of 10 modules you can realize two independent redundancy configurations.



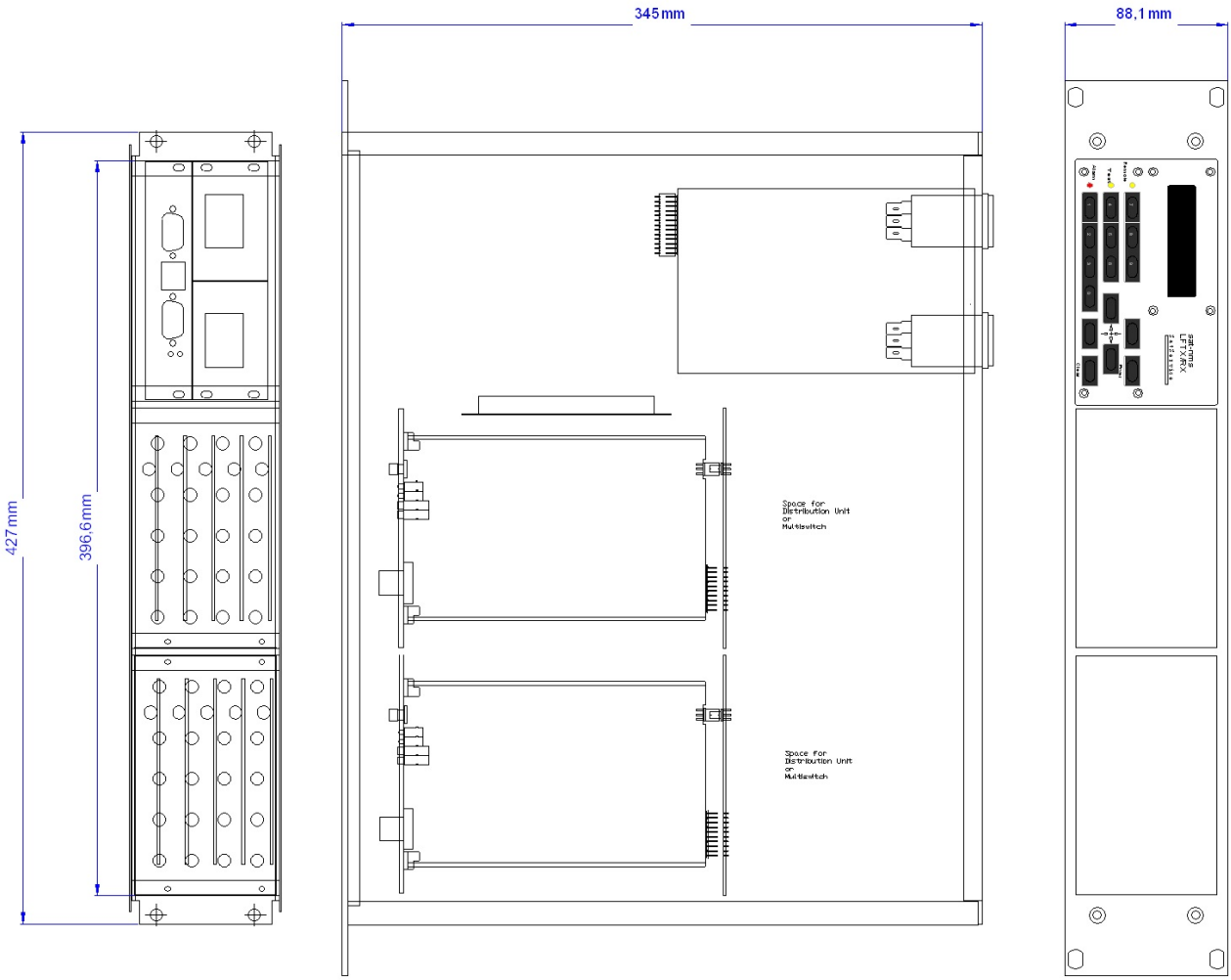
Another version provides the additional redundancy switching capability for external LNC. Based on the standard chassis this unit contains also the necessary IO driver hardware card which drives a combination of 2/4 waveguide or coaxial switches for redundancy switching of the corresponding LNCs. The switchover criteria is LNC current window. This unit provides a 2:1 protection. The external redundancy definition is only available on request.

There is a second redundancy definition (intern2 and extern2). If you select this redundancy definition, the left and the right redundancy combinations will be switched synchronous. For example if in the left column slot 2 is switched to slot 3, then in the right column slot 7 is switched to slot 8. The behavior is the same for extern2, but for an external device. The external redundancy definition is only available on request. On the next picture you see an external redundancy definition but only with the Optical Transmitter.



5.5 Outline Drawing

2 HU unit with 10 slots


345mm
88,1mm
427mm
396,6mm
Space for
Distribution Unit
or
Multiswitch
Space for
Distribution Unit
or
Multiswitch

6 Specifications

RF Specification	
Frequency range	950 to 2150MHz or 50 to 2150MHz
L-Band Input Connectors (Transmitter)	SMA female 50Ohm or BNC female 75Ohm
L-Band Output Connector (Receiver)	SMA female 50Ohm or BNC female 75Ohm
L-band input test connector	SMA female 50 Ohm
L-band output test connector	SMA female 50 Ohm
Optical connectors	E2000 or FC/APC
Input Return Loss	> 17dB
Output Return Loss	> 17dB
Input Noise Figure	< 30dB
Gain (adjustable via local and remote interface)	+15 to -15dB in 1dB steps
Flatness	+/-1.5 dB, +/-0.25dB in any 40MHz
Input signal max (total level)	-10 dBm
Output Level max (total power)	-10dBm
Intermodulation at -13dBm Input Level	<-40 dBc
DC-output at L-band input connector	16+/-1V
M&C Interface Specification	
Ethernet interface for M&C and user interface	10-Base-T, Via http GET requests
Front panel display	LCD 16x2
RS232 M&C Interface	D-SUB 9 female
Summary fault indication	Relay contact D-SUB 9 male
I/O output for external WG-switching (transmitter)	SUB-D 9 socket
Electrical and Mechanical Specification, Environmental Conditions	
Supply voltage	90 to 230V AC 50 to 60Hz
Connector for the two mains voltage AC input	IEC
Redundant power supplies	Hot swap capability available as an option
Temperature range	-20 to + 50°C
Humidity	up to 90% non condensing
Mechanical size of mainframe	436 x 89 x 350 mm (WxHxD), 19" 2HU